

Effects of reservoir operations on individual species and communities: A watershed perspective

by Dena Dickerson, Chester O. Martin, and Hollis H. Allen

The U.S. Army Corps of Engineers manages natural resources in more than 2,000 watersheds in the United States (Juhle 1997). These include approximately 460 water resource development projects (primarily reservoirs) where nearly 12 million acres of land and water are owned in public trust. Corps reservoirs and their associated aquatic and riparian habitats represent important systems that may influence natural resources both within and outside of a project's boundaries. Water-level manipulation and other operations at these projects have potential adverse impacts to various ecosystems and their associated plant and animal species. Recently, Corps Districts, the U.S. Fish and Wildlife Service, and state regulatory agencies have reported impacts to certain threatened, endangered, and otherwise protected species resulting from project operations (Figure 1). The impact of Corps projects on environmentally sensitive species needs to be evaluated from a watershed perspective and a habitat perspective to provide better guidelines that will lessen impacts and improve watershed conditions.



Figure 1. Bald eagles are known to occur on over 50 Corps projects. Photo courtesy of Mike Watkins, U.S. Army Engineer District, Kansas City

A study entitled "Reservoir Operations - Impacts on Habitats of Target Species" was initiated in FY98 under the Ecosystem Management and Restoration Research Program (EMRRP). This study is being accomplished as four tasks:

- ◆ Assess the scope of the problem and identify species whose habitats are likely to be affected by Corps project operations.
- ◆ Group species by habitat and/or life history requirements and prioritize species groups and potentially impacted resources.
- ◆ Identify sources of resource management conflict, and assess the short- and long-term impacts of project operations on the various species' habitat requisites.

- ◆ Develop habitat-based guidelines for protection and management of target species potentially affected by the operation of water resource development projects from a watershed perspective.

Data for the first task were gathered primarily from responses to two surveys sent to resource managers at 455 Corps reservoir and/or other water development projects. Prior input from Corps Districts and regulatory agencies indicated that there were immediate concerns regarding impacts to sensitive turtle species. Therefore, the initial project survey dealt exclusively with turtle issues (Figure 2).



Figure 2. Corps project operations potentially affect the habitats of numerous turtle species. Photo by Dena Dickerson, USAEWES

Responses were received from 319 of 455 projects (70 percent), representing 30 of 31 Corps Districts. One-hundred-and-five responses (33 percent), representing 14 Districts and 6 Divisions, reported known issues concerning sensitive turtle species, and 214 projects (67 percent) indicated no known turtle-related issues. Twenty-five species of turtles were identified at the 105 projects, including 3 Federally protected species, 4 species currently being considered for Federal protection, and 18 species with protection in at least one state.

Turtle species were categorized into the following seven groups according to their habitat or life-history requirements:

- ◆ Snapping turtles.
- ◆ Map and sawback turtles.
- ◆ Wetland turtles.
- ◆ Riverine turtles.
- ◆ Softshell turtles.
- ◆ Mud or musk turtles.
- ◆ Terrestrial turtles.

Most turtle groupings also exhibited taxonomic similarities. Grouping species into categories based on habitat and behavioral similarities will facilitate analysis of potential impacts and development of management recommendations that will benefit an array of species that use resources in a similar way. Potential impacts identified for turtles included changes to vegetation and other habitat parameters that result in stresses on life history requirements such as feeding, reproduction, nesting, shelter, and various species-specific behaviors. Habitat changes that alter critical food supplies may impact specific size classes within a species or taxonomic group or all size classes. Reductions in the number of suitable basking structures can severely change the distribution of species with strong basking tendencies. Water level fluctuations during cold weather can flood hibernation sites and drown vulnerable species. The most commonly reported issues regarded potential destruction or alteration of nesting habitat. The potential environmental impacts from these issues may include changes in species distribution, declines in population number, or shifts in population structure (e.g., age and sex ratios). These impacts could further reduce population numbers of species that are listed as state or Federally threatened or endangered, or species of special concern.

The second information survey addressed all other sensitive species of potential concern at these same 455 projects. Responses were received from 278 projects (61 percent). The 71 species identified for these projects included 52 Federally protected species and 19 species with protection in at least one state. The

taxonomic distribution of these 71 species included 15 birds, 15 plants, 13 fishes, 10 mussels, 6 mammals (Figure 3), 5 insects, 4 reptiles (excluding turtles), 2 arachnids, and 1 amphibian.



Figure 3. Several Corps projects have noted concerns with bat species

Information on sensitive species was also obtained from a natural resource management survey mailed to a stratified random sample of 66 projects in 1996. This survey, conducted under the Corps' Natural Resources Research Program, contained a section that solicited information about the occurrence, status of inventories, and management issues associated with Federal and state listed species on Corps projects. Sixty-two projects (94 percent) completed and returned the questionnaire. Results related to natural resources management on Corps projects are described in Kasul, Martin, and Jackson (1998). For the present study, these data were reexamined to obtain more detailed information about sensitive species and their potential influence on project operations. Additional information on Federally listed species, their occurrence on project lands, and Corps responsibilities with respect to endangered species recovery plans was obtained from Allred (1996). Products from this study are designed to proactively ad-

dress issues that are identified as high priorities at projects where Corps' operations have an impact on the habitats of sensitive species.

Another goal of the study is to provide resource managers with technically valid and consistent resource management tools for handling sensitive species issues. Technical notes describing ecological and life-history requirements for selected groups of species with similar habitat affinities are being prepared as products of tasks one and two. Seven technical notes have been completed on life histories and potential impacts to habitats of turtle species. These notes summarize the current Federal and state legal protection status of the turtles and their known distribution within Corps jurisdictional boundaries. These technical notes are currently in press and will be available as links on the EMRRP home page (www.wes.army.mil/el/emrrp). Additional notes are being developed for other groups of species. Completion of Tasks 3 and 4 will result in technical notes on resource management conflicts and potential impacts of reservoir operations on priority species and their habitats. Habitat-based guidelines for the protection and management of sensitive species potentially affected by the operation of water resource development projects will be the final product of this study. Study recommendations are intended to benefit the greatest number of species and have the least effect on project operations.

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Calendar of events

Jun 14-18 USACE Prospect Course—Riparian Zone Ecology, Restoration, and Management, Course No. 281/CEW-PD, Session 99-02, Fresno, CA (several spaces still available—call Huntsville immediately to enroll).

Jul 26-30 USACE Prospect Course—Ecosystem Planning and Management Issues, Course No. 264/CECW-PD, Vicksburg, MS.

New publications

A new series of EMRRP technical notes will be available on the World Wide Web at <http://www.wes.army.mil/el/emrrp>. The technical notes are as follows:

- Technical Note EMRRP-SI-01 . . Sensitive Turtle Habitats Potentially Impacted by USACE Reservoir Operations
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- Technical Note EMRRP-SI-02 . . Snapping Turtle Habitats Potentially Impacted by USACE Reservoir Operations
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- Technical Note EMRRP-SI-03 . . Map and Sawback Turtle Habitats Potentially Impacted by USACE Reservoir Operations
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- Technical Note EMRRP-SI-04 . . Wetland Turtle Habitats Potentially Impacted by USACE Reservoir Operations
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- Technical Note EMRRP-SI-05 . . Riverine Turtle Habitats Potentially Impacted by USACE Reservoir Operations
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- Technical Note EMRRP-SI-06 . . Softshell Turtle Habitats Potentially Impacted by USACE Reservoir Operations
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- Technical Note EMRRP-SI-07 . . Mud and Musk Turtle Habitats Potentially Impacted by USACE Reservoir Operations
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- Technical Note EMRRP-SI-08 . . Terrestrial Turtle Habitats Potentially Impacted by USACE Reservoir Operations
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